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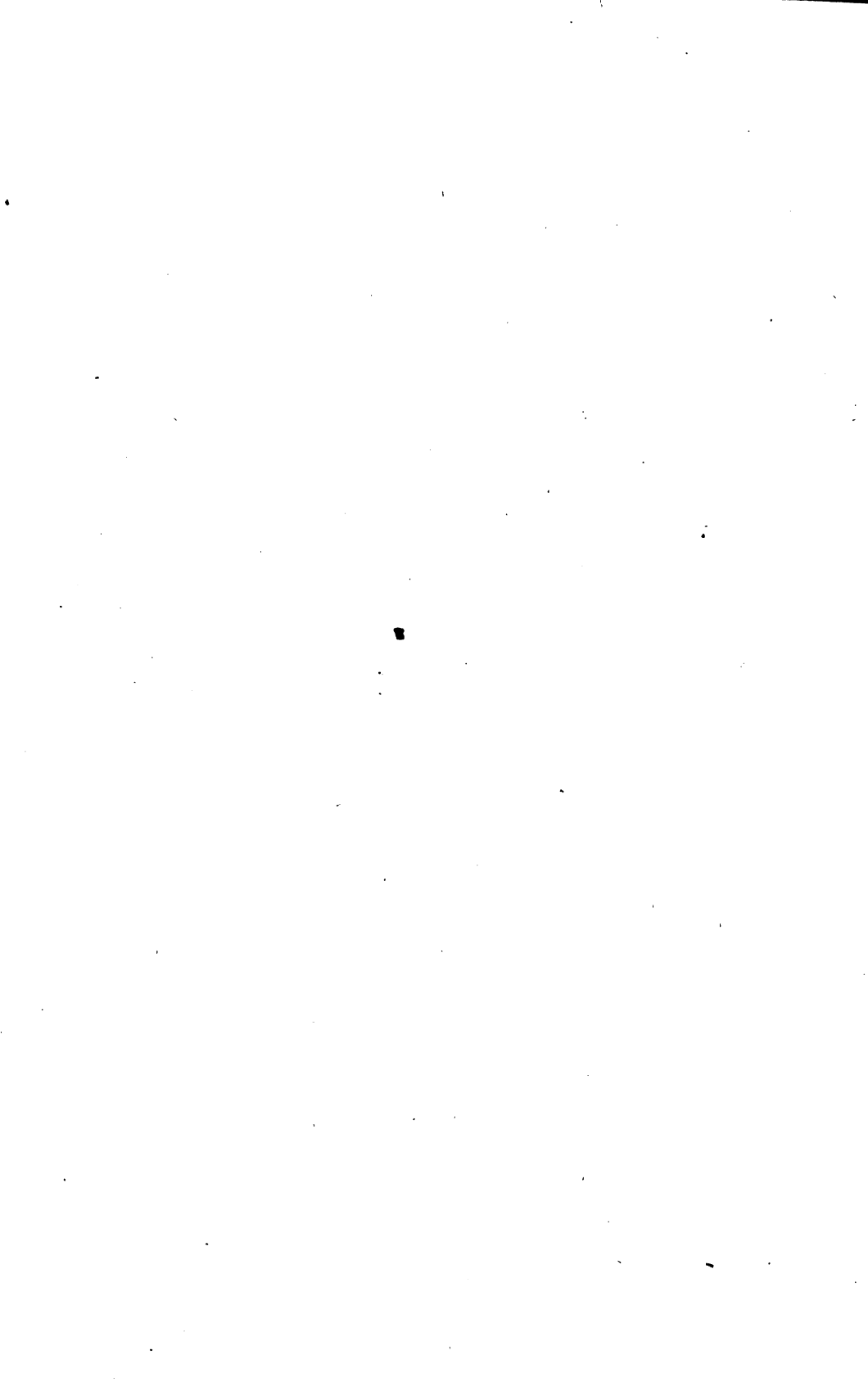
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*from Levi Woodbury*

THE ANNUAL ADDRESS

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THE NATIONAL INSTITUTE,

IN THE

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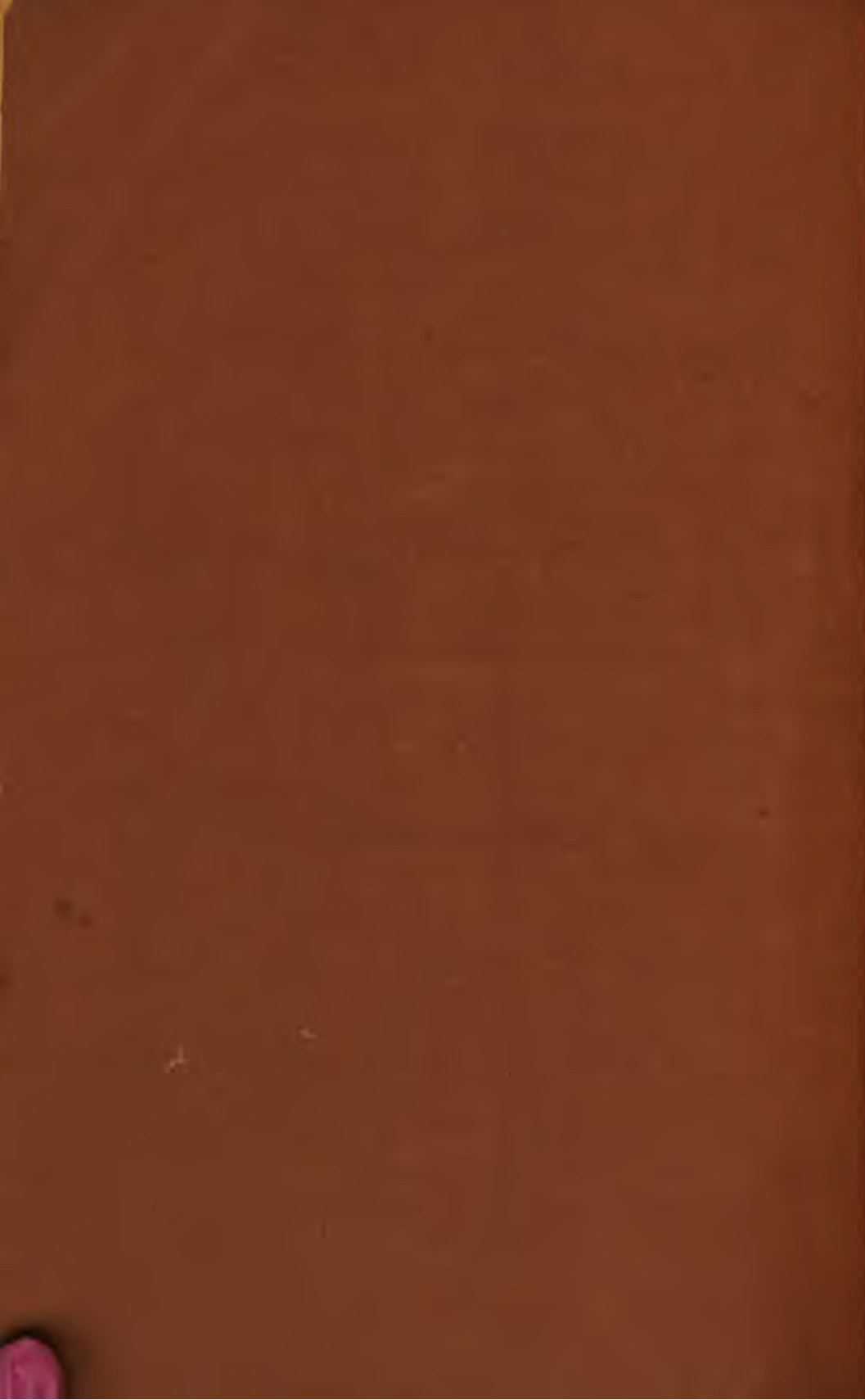
JANUARY 15, 1845.

BY

LEVI WOODBURY.

WASHINGTON:

J. AND G. S. GIDEON, PRINTERS.  
1845.



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*Lawrence Shaw Mayo*

At the meeting of the NATIONAL INSTITUTE, of 14th January, 1845, at which the Annual Address was delivered by the Hon. Mr. Woodbury.

On motion of Rich'd S. COXE, Esq., Mr. W. W. SEATON was called to the Chair, and Jno. K. Townsend, was chosen Secretary.

On motion of R. S. COXE, Esq., it was unanimously resolved, That the thanks of the NATIONAL INSTITUTE be presented to the Hon. Mr. Woodbury for the able and interesting address delivered this evening; and that a copy be requested for publication.

True extract from the minutes.

JNO. K. TOWNSEND, *Secretary.*

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WASHINGTON, 16th January, 1845.

*To the Members of the National Institute:*

GENTLEMEN: I feel much obliged by the kind manner in which you request a copy of my recent address; and, though conscious of many imperfections in it, consider myself bound to place it at your disposal.

Respectfully,

LEVI WOODBURY.



## ADDRESS.

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One of the objects in the formation of the NATIONAL INSTITUTE, was to promote the public interests through the aid of Science.

As we are all anxious to accomplish that object, it may not be unprofitable to devote some attention to the consideration of what is most likely to hasten it, in a position like ours, and with encouragement, or means, such as exist in this country.

There are different employments of the mind connected with improvements by Science, which demand notice, and which, though highly essential to success, are very unlike, and not equally suited to the circumstances in which most of us are placed. One is the collection of new facts; another is the discovery of the organic law which produces or governs those facts. Without the former, the highest powers of genius would lack proper materials for new deductions and systems; while, without the latter, the industry of mankind would be lavished in gathering materials rather than in using them. We should have timber and brick, granite and marble, but not a temple or pyramid, or even cottage, rising in fair architectural proportions. In short, the condition of Science, where only facts are amassed, is the chaos of matter which preceded the creation—"without form and void"—and requires some spirit to "move on the face of the waters," to produce life and beauty as well as usefulness. On the contrary, the talent to analyze or compare, combine and construct, without the possession of suitable facts, runs into the wildest vagaries. Errors are adopted, and theories the most imperfect countenanced, from the want of that full collection of materials and experiments, which are indispensable to reach sound conclusions, and on which alone any solid scientific structure can be raised. A third exercise of mental power, connected with Science, is a species of creative talent, akin in grandeur to that which formed matter itself; it is to shape all such facts and laws to new purposes and improvements. It resembles the superiority of the architect over his mute materials, or even the maker of his brick or the hewer of his wood, or the striking dominion of the general in battle over his rude masses. But unite these qualities or pursuits, and every thing is attained which is practicable. Their combined efforts, as in architecture, for example, produce the useful dwell-

ings, as well as classical temples of the age of Pericles, and all the beautiful forms of Ionic and Corinthian elegance.

It would require no high degree of skill to decide which of these employments of the mind, in respect to Science, is most elevated and desirable, where the condition of society is such as to yield no peculiar preponderance to one over the other. For, independent of that, we could not hesitate, when directing our efforts to one branch alone, to concentrate them on the arrangement of facts, and the deduction of elementary laws from ample materials already gathered, or even in laboring to apply them to new designs; though, by offering this opinion, I would not be understood as thinking that the mere collection of facts is not best suited to some conditions of society, and that he who furnishes them for scientific labor, however acting a humbler part than he who learns their qualities, or he who moulds and directs them to new discoveries and profitable ends, is not a necessary co-laborer in the field of knowledge, and does not perform a valuable service in the great search after truth.

How we and those around us are situated in relation to these employments, should be ascertained with care, in order to apply our energies in the manner most promising and appropriate. Rightly to understand, and rightly to "define our position" as to this subject, may also, as is the case at times with politicians, help the Institute, and even our common country, to escape some unmerited censure, and will tend to procure more readily any assistance towards further progress which our condition and exertions may seem to deserve.

It is proper, then, to remember, in the outset, that the anglo-American mind has never been in the uncultivated condition in which our ancestors found the soil of this country. The intellect, morals, manners, and general acquirements were, at the very first, those of the old world, as it stood two hundred years ago, rather than those discovered among the new races here. Many, considering only our youth as a nation, have overlooked this, and forgotten the old age that belongs to our people—not coming here as barbarians, living on acorns and clad in skins—or being, as to intelligence and arts, in the hunter, or even pastoral state, but crossing the Atlantic as adults in mind and civilization, with advanced acquirements, derived from the treasures of near forty centuries of science, as well as of arts and letters, all open to their gaze, and daily mastered by industry and talent. As a people we have lived as long as those of England, France, Germany, and Spain, whence we came. We possessed, from the start, all the improvements which they possessed at

the time we separated from them; and it was only when their ancestors were carried in chains to Rome, as painted savages, after making Cæsar and his legions at times fight for life rather than victory, that ours were savages—but no longer nor later. What, then, should be the difference between us and those parent nations as to progress in scientific affairs?

It is, I admit, all which flows from the facts, that we have been, for two centuries since, placed in a less cultivated country, and been tempted to engage more at first in the chase and fisheries, and a ruder agriculture, and that most of us have been left more dependant on individual means and energies; and, for the last three generations, have lived under a form of government more equal as to rights and property. When looking, therefore, to scientific researches, remote in their advantages, or chiefly speculative in their tendency, it would be disingenuous for us to deny that some obstacles have arisen here to rapid advances in such researches, from the existence of the different circumstances before mentioned. Because every profession and employment, as well as office, being here open to all, talent finds temptations and rewards more numerous than elsewhere, beside those which strew with attractions the paths of science; and the division of property is so equal among us, that a larger proportion must pursue what is immediately profitable and will yield a livelihood; and hence, if devoted to science, must mould it more frequently to objects of speedy profit, rather than glory or benefits not soon to be realized.

But these differences, when duly considered, will be found not to have stripped our population at large of their former acquirements, nor of the power to transmit them, with many valuable additions, to their grateful children; and though depriving a few in some scientific pursuits of so lavish a patronage as elsewhere, these differences have led to a more general education and elevation of the masses, which have enabled them to appreciate better all the fruits of science, and, instead of rendering those fruits undesired, unnecessary, or unrewarded, have, in some particulars, caused a much wider and more encouraging demand for them, both in public and private enterprises. Thus, in our rapid career, the call for every thing conducive to practical utility has proved so strong, that science has been applied to enrich and strengthen us in ways far more numerous than many imagine, or than ever existed before. And we have not only seized on the improvements of others for this purpose, the world over, but have resorted to countless inventions of our own, and to some original thinking and laborious researches in cases where others appeared deficient, and the demand here was exciting.

Such, then, is our position; and, in this view of it, that which seems to be most needed for promoting the public interests further, through the aid of science, is to bring our means into co-operation more with our genius; and to have our materials and talents more wedded together in the higher, no less than other, walks of science; and more dedicated, heart and hand, to enlarging its boundaries, as well as making new improvements by its agency in agriculture and the arts, commerce, manufactures, and all which pertains to human progress.

Even beyond this it would be useful, if we had a few more individuals, situated like Tycho Brahe, to advance science itself, with dispositions to spend years in mere observations and experiments connected with it; and, when necessary, be content to leave the records of them for future Keplers to digest into beautiful laws and systems; and it would be still more useful when, as in his case, such dispositions are united with means to expend thousands in erecting laboratories and observatories, as well as forming gardens of plants and new instruments to advance natural history and astronomy. Improve and extend science itself in ways like these, and you improve and extend the benefits, no less than the pleasures, that may be derived from the use of it. And if communities and governments were more alive to this great truth, and if a conviction of its importance for practical good to the many, as well as for mere theoretical discoveries, or mere intellectual enjoyment to a few, would be produced as strongly in the many as it is in a few, most of the difficulties that exist as to the further encouragement of science under our political and social systems would be speedily surmounted. For then the thought, mind, enterprise—of which we have an ample supply in some—and the means or materials—of which we have enough in others—would all be brought to co-operate more efficiently, and on a scale more wide and regular. And then the philosopher and patriot, the scholar and philanthropist, would all find this one mode—and a glorious as well as sure mode—to crowd forward their several aims in the cause of science, liberty, and humanity. Like the poet, we should then feel more strongly that science was the “mighty changer of the world;” and hail him as not only “the soul of art,” that tills the earth, spans the floods, and works a myriad of other practical benefits around us, but say—

“Fire, air, earth, water, are at thy command:  
O’er all, like magic, doth thy touch prevail.  
And at thy beck rise towers and temples grand;  
And pyramids, that countless ages stand.”

7

But how is the conviction I have spoken of as so desirable to be produced? How sink it deeply into the public mind? In my opinion nothing is more likely to accomplish this than the consideration of several things, which have already been done here in the use of science, and which have proved very successful to better our condition. Let me caution you, that I do not refer to a retrospect of the improvements which have been made here in the sciences themselves, (to a critical knowledge of which I make no pretension,) but rather to some of the most striking cases, where their assistance has been widely invoked among us, and proved highly useful. Under many disadvantages, private enterprise, as well as public, have much oftener than most believe, resorted to scientific aids for ameliorating our condition. Not so far or so fast, I grant, as some have desired, yet always as fully as public opinion became convinced it was advantageous, and as other imperative duties, growing out of our national condition, would warrant. If you ask for particular evidences of this, I could point them out on almost every river, every hill, as well as prairie and valley, in our extensive Union. Look, first, at one or two illustrations in private life. Suppose a traveller in some remote gorge of the upper Nile to come suddenly on a structure, several stories in height, and over four hundred feet long—as was my lot the last summer, near one of the numerous waterfalls of the Merrimack, in my native State, and where, fifteen years ago, stood a forest, skirting a mere sand-bank. To the boundless power of what Sesostris, or Pharaoh, would the vast pile be attributed? Yet, in my case, the whole was the voluntary production of free men, during a few months only; and that, put in motion by the enterprise of only a small number of capitalists in the neighboring country and cities. But let the traveller pause longer, and lifting his eyes, see, beyond, below, and around, many other structures, nearly equal in magnitude, all instinct with life, crowded with every age and sex—thousands of busy spindles and looms, swelling the Babel hum, and all animated by machinery; on which genius and science combined have worked every wonder, except imparting the faculty of varied speech! Let him see them, all devoted to shape into new forms an article of our own growth, which (fifty years ago, hardly known to be produced among us) has, by the aid of scientific ingenuity through the cotton gin, been made to furnish more than two-thirds of the raw cotton for the whole human race; and moving onward, let him discover similar edifices rising, as if by magic, on hundreds of other waterfalls: and, where these do not exist, starting up in

the very heart of cities, and running their almost eternal round by the invisible power of steam, through like scientific skill. And then let him reflect that all this is also private in origin and ownership, rather than the fruits of public oppression, wrung from the sweat and tears of down-trodden millions—or the plunder accumulated by conquests, such as those of Carthage or India—or the Incas and Montezumas of the new world; and what astonishment must then overwhelm him in all his preconceived conceptions of the feebleness of science and of individual effort! And what marvels does it prefigure to us all, yet to spring from the further application of scientific skill in human affairs, under the impulses of superior education, still going on among the whole community, and of more free and equal influences so liberally showered upon them by Government! The idea is flung out, I think, by the younger D'Israeli, that Manchester, in England, is as striking to illustrate the triumphs of science, as London is those of commerce; or Paris, those of fashion; or Athens, those of ancient art; or Rome, of conquest; or Jerusalem, those of religion. But look a little further at another case. Suppose some Anacharsis could be recalled from the tomb, and witness not only all these establishments among us, but the transportation of their fabrics by scientific railroads and steamers, over this vast continent, which his travels and probably his dreams never reached, and thence into the heart of Europe, or on the other side of the globe, up the splendid rivers even of the Celestial empire—would he not imagine that some power, greater than Egyptian, Macedonian, or Roman, had arisen, and devoted long all its usurped energies to the accomplishment of such wonderful undertakings? Yet we could tell him, that the whole is but another fruit of modern progress in science and its various uses, under the direction, in most cases, of only individual enterprise—a single mechanic, here and there, like Whitney or Fulton, giving birth to an invention, and then sustained in putting it into operation by the voluntary investments of some merchant or physician, or of some independent farmer or lawyer. This is true not only of the vast machinery in manufactures in this country, but of many of those canals and railroads so subsidiary to them, and equally as astonishing as works of science and private enterprise, whether the Green Mountains are to be tunnelled, or their ridges cloven down by deep cuts; or merchandise or passengers are to be whirled over half a continent in a few days. Private enterprise in many, though not in all, has furnished both the science and the capital. It feeds the iron monster that draws all, and

projected the mighty plans for their pathway : First, by the bold projector ; then, by the intelligent engineer ; next, by the wary yet far-seeing economist, whether saving his few thousand dollars to adventure in such enterprises, from fattening flocks, raising wheat and corn, or sending " notions " in commerce to the antipodes, or healing the sick or defending the oppressed. The government of these great establishments also, is almost as scientific, and quite as regular, as that of a locomotive itself, and requires no public principalities and powers to manage it, but is moved by a mechanism of individuals, simple and unostentatious as Puritanism. Thus a small board of directors, in some ten foot counting-room or obscure parlor, with one or two young men, with quills behind their ears and ledgers on their desks, constitute the whole paraphernalia of their management. These despatch to every quarter of the globe the orders which control every thing : it may be to import cotton from New Orleans, or wool from New Holland, or dyes from Turkey, or iron from Russia ; or to send bales of Stark sheetings to Liverpool, and Lowell drillings to Canton ; or to bring new scientific colors and scientific machines from the laboratories or workshops of Europe : still the same private electric spark giving motion to the whole, and through the mysteries of double entry keeping the results of the whole with the accuracy of mathematics and the rigorous analysis of the highest logic.

Nor is it unusual here for a single master mind in commercial life to put into action machinery still more distant and difficult, and if not strictly scientific, yet calling to its aid all the fruits of science calculated to be useful—as was felt on our Northwest coast through Astor before the late war, and as is felt often since in the markets of the world—by voyages first figured out on the back of a letter or one's thumb nail ; sending specie, if need be, to Bombay or China, collected by our merchant-kings from all quarters of the globe ; or cotton, or lead, or ginseng ; or, when the great laws of trade require a different course, a draft of three lines, as much respected among the Hong traders, or in Amsterdam and London, as in Wall street in New York. Another striking case of the use of science here by private enterprize has been in the forests of Illinois, Missouri, and Wisconsin, crowded with geologists and workmen in search of lead, and augmenting it so in a few years as to supply not only our own immense wants, but those, in part, of Europe and Asia. A few humble diggers, guided by a zealot here and there in mineralogy, have put in motion the capital of the merchant and the enterprize of the navigator, till the whole world witnesses their effects as

applied scientifically to this wonderful treasure of the giant West. A similar illustration exists in the case of our mineral coal. Let travellers look at the mountains of it, piled up on the levee at New Orleans, or on the banks of tributary rivers thousands of miles in the interior. Let them look at the same on the Schuylkill and Delaware, on the Potomac and Hudson, and all the busy waterfalls, where thousands of manufactories start up, not only to turn the spindle for the finer fabrics of cotton and wool, but draw out the solid iron into threads, or wire almost as minute, or mould it into anchors and cables so massive. Let them look at the coal in all our Atlantic cities, heaped up even on the busy wharves of Bangor, though thence exporting so much wood and lumber, and reflect that, whenever the spurs of the Alleghanies have been undermined for these dark treasures, or the bowels of the earth penetrated hundreds of feet, as on James River, to obtain the means for light and heat over every navigable portion of the Union, it has been aided by the various applications of science, and the enterprize started by some mechanic, or planter, or lawyer, rather than by powerful governments.

The great increase in the manufacture of iron among us, now computed to exceed in quantity either Russia or Sweden, and extending from the coarsest ore in the mine to the most delicate surgical instrument, furnishes in many of its operations still other illustrations of our rapid progress in the use of science, under the strong impulses of private interest.

So have we beheld agriculture, waking from her sleep of ages, by means of chemistry and geology, applied to enrich one worn out field by mere gravel—and another by mere clay—one fertilized by lime, which was before waste—one drained into warmth from the coldest swamp—another irrigated to abundance, which was before an arid sand bank, and crops and renovations witnessed, by new composts and chemical compounds, never before dreamed of. The springs in motion, to make so many waste places blossom like the rose, have been started by science, and her private votaries, rather than governments, by Danas and Jacksons here, as well as Davys and Leibigs abroad, and are revolutionizing the whole system for the better, under the practical experiments of such real benefactors to agriculture—as the Buels, Phineys, and Ruffens, among the people at large.

Advert a moment to another consideration connected with the increased use of science here, in cooperation with some of the fine arts. Who can compute the amount of labor and talent engaged in this country, no less than abroad, in devising and executing ornamental figures for cotton and



woollen fabrics, as well as silks? for the prevention of counterfeiters in bank notes and bills of exchange? and for illustrating periodicals? books of fancy, natural history, travels, and exhibiting every variety of engineering, surveying, and geographical explanations? When we remember, that it is science and some of the fine arts, which are thus humbly employed, and for the use of the poorest and the middling interests, no less than for the highest in intellect, and the most advanced seminaries of learning, and the wisest public bodies, the change in their functions, and their practical usefulness, becomes wonderfully developed under the impulsive genius of institutions like ours. From ornamenting cathedrals, and churches, and galleries, and palaces; and from diffusing the splendid results of such voyages as those of the *Astrolabe* and *Coquille*, or the *Vincennes*, the powers of drawing and engraving have been reinforced by those of the daguerreotype, as well as lithography, and have thus been applied to spread more cheaply useful knowledge into every rank and pursuit of life. The broad line of discrimination here, usually is, that science, to be much patronized, must devise new instruments of profit or pleasure to numbers; and whatever of its labors has turned out to be either useful or agreeable to the many here, has always been amply rewarded, crowning many inventors with princely fortunes, and drawing crowds to witness its wonders in the solar microscope, or in astronomy as explained by Lardner, or in the historical mysteries of the coasts, rivers, lakes, and mountains of our continent, as decyphered by such geologists as Cleaveland, Hitchcock, and Leyell. So, besides the daguerreotype, with all its increasing use and marvels, it will be seen that the panorama also, and its popular fascination, the kaleidoscope with its beauties to the eye, and its benefits in the arts, the illusions of the fantascopes, those brilliant philosophical and chemical experiments, that amuse millions, and the fire works of all kinds, which so often make the holidays of half the world so inviting, all rest exclusively on the aid of science for their powerful attractions.

Some other things chiefly of a practical character, and chiefly assisted by private enterprise, may usefully be adverted to, and a portion of all of them illustrated in more detail, where our national progress since the revolution has in many respects been much advanced by the aid of science.

Our new forms of government could not at once develop their full influences in these respects on the community at large. Old notions and habits, old theories, prejudices, and laws, could not be changed but gradually, if wisely. Arbitrary power had been uprooted, rather than

manners, or the arts, and the literature, and fashions of society ; and where chaff was to be blown away from the wheat, both care and time became necessary to avoid injury. But, as was most natural, we began with the science of government, improving it by means of written constitutions, as well as a more equal representative system, and placing legislation more immediately under the control of the people, and making it more practical and wide in its objects. The endeavor has been made in these ways, and with some success, to work out that difficult problem of preserving in order and prosperity, popular privileges, which in many other places would tend to anarchy ; such as the free suffrage of the many, their eligibility to office, their equal rights to hold property and pursue all kinds of business, and their participation in all the benefits of legislation, as well as in the administration itself of the laws, that are made. Indeed, on no topic, has more science and talent been employed than on the political machinery of our General and State Governments, and in the making and execution of the laws under them ; and in none have these qualities been exercised with greater vigilance and devotion, to secure as well as advance the interests of the whole. So the tendency in our systems of education since the revolution, has been more and more towards instruction in the sciences, and their application to the arts, expecting thus to forward, with greater efficiency, the practical business of life, and benefit numbers rather than a few. Academies, institutes, and colleges, have done much more of late, that is new, for philosophical instruments and chemical lectures, and experiments and collections in mineralogy and natural history, than for belles lettres ; and it is vain to attempt to shut our eyes on the impulses, which the public mind has acquired to mould education more, for the practical benefits of the many. Indeed, to promote such benefits in this, and other ways, have been some of the greatest efforts and rewards of American genius, even from an early day. Thus Franklin, though distinguished for *drawing lightning from the clouds*, no less than helping to *pluck the sceptre from tyrants—Eripuit cœlo fulmen, sceptrumque tyrannis*—became much more widely known, if not enriched, by applying his sublime discovery to protect the dwellings of the many from electric fire, and using philosophy for the immediate benefit of millions through his humble improvements in stoves. The genius of few has been more successful in turning science to practical purposes, and especially economy in the use of heat, than that of another American in Count Rumford. And though it was most fully developed in Europe, so as to gain there both wealth and rank, yet

the impulses were given to it here before his emigration. So we all know that Bowditch, the translator of Laplace on the mechanism of the Heavens, found something more of profit, perhaps if not fame, in compiling his useful navigator for the multitude who plough the ocean, and in computing annuities for the purposes of practical life. The same might be said of the labors of several of our mathematicians for popular use, as compared with their productions on topics more speculative. And all elementary books, domestic and foreign, well calculated to yield useful instruction to many, have usually been encouraged here in the most ample manner, and in instances too numerous for recital; as have been any scientific improvements in teaching itself, by such men as Lancaster or Pestalozzi, or by others, enabling us, in some degree, to impart speech to the dumb, and sight to the blind, and hearing to the deaf.

We have, likewise, made some progress in the use of architectural science. But it has taken chiefly a like practical direction, and the most rapid advances have been either in private dwellings for daily occupation, or, when the highest acquirements and largest expense are employed, it is for a building for business rather than show. It is for a custom-house, court-house, state-house, hospital, and not a Brighton palace or Versailles—a Seraglio or Pyramids. Or, it is to build colleges to educate the many, to erect churches and cathedrals for crowds, to have capacious town-houses and city-halls for the accommodation of the people at large; or, in military and naval architecture, to form massy forts, breakwaters, dry docks, and vast ships of the line for general defence, rather than, as in despotisms, to wring out the tears and toil of millions to build palaces of ice, or construct barges of pleasure, adorned, like Cleopatra's, with silk and gold, to gratify the love of pagantry in royalty alone.

The higher branches of science have been turned to another most useful, and, at the same time, striking account among us in practical life, in hydraulics. Not only have numerous detached dwellings, but almost every large village and city been indebted to this, in an ample supply of water, for one of the greatest means of comfort, health, and beauty. Both distance and height have been overcome with ease, however uneven the surface, by applying scientific principles, through pipes of wood, or lead, or iron, or burnt clay, without any resort to the awkward and costly stone aqueducts of antiquity, requiring intervening mountains to be cut down, and deep valleys filled, in order to form one regular inclined plane for the whole distance. In a like manner, science has here

overcome another obstacle, formerly insuperable in aqueducts, when the head of the supply was too low ; as now, by the power of wind or steam, or water itself, a quantity of water can be elevated into reservoirs high enough and large enough to spread a sufficiency, both for ornament and use, over our most populous cities. The Fair Mount works at Philadelphia, present one of the most beautiful specimens of this victory over natural difficulties, applying the principle on a most magnificent scale, which had, by science, been otherways used before, no less than since, to irrigate the banks of rivers, or raise water from the ocean into numerous vats to be evaporated into salt. But surpassing, in some respects, perhaps, all the monuments, as to hydraulics, of modern times, or even antiquity, whether in Egypt or Carthage, Greece or Italy, is the Croton aqueduct of the empire city of New York ; whether we look to its length, capacity, and expense, or consider that it is the enterprise of a single city, instead of a State or kingdom, and that it has been completed, not by plunder or the forced toil of enslaved millions, but by the free will of free men, and by their own voluntary contributions and obligations. The extensive use of science in canalling in this country, is another illustration of our great progress in the encouragement of it for practical objects. It is not merely the introduction of locks, instead of cranes and inclined planes, which has changed the whole aspect of canals in modern times, from what it was in antiquity, or is now in China, though so long celebrated for its artificial aids to internal commerce. But, beside the great number here, what in length, and grandeur, and difficulty, are the eighty miles of Egyptian canal across the isthmus of Suez, or a few furlongs more of it, a century or two ago, through the swamps of Holland, compared with those uniting the Ohio with our inland seas, and the three or four hundred miles that wed the waters of the Atlantic with those of Lake Erie ? And how strikingly does the last enterprise develope again the combined power of a few free people here, over the might of monarchies or despotisms elsewhere, even in matters requiring scientific exertion, when we behold this, emanating from only one State out of twenty-six in our youthful confederacy, and being the freewill undertaking of its masses ?

The improvements in railroads among us, are another evidence of all these positions, and are full of hope for the cause of science, when usefully directed. With what success has it enabled these roads to extend from the inclined plane of collieries and mines, not only over the level paths of the ancient Roman highways in England, but here to cut

through mountains, span rivers on viaducts, cross arms of the sea on piles, and transport passengers and freight, in almost every direction, with speed exceeding the winds. Indeed we have so advanced in this, as already to be able to furnish both engineers and locomotives for some portions of Europe.

But time forbids me to enlarge on it, or on the valuable contributions of science here, by means of bridges—these last, yearly taking place, more and more, of the dangerous ford and tardy ferry, and yearly improving in both cheapness and durability. Or the efficient aid of science in lighting our cities by gas, and imparting to our coasts greater commercial safety—giving us, instead of the rude faggots, kindled nightly on some promontory, or of some costly colossus, as at Rhodes, to hold burning coals in his hand, to guide the mariner—all the improvements in glass to contain oil, or furnish shelter to the flame, or reflect it; and all the improvements in color and revolvings, no less than in oils themselves, so as to save many more lives, and millions of wealth, at an expense comparatively trifling. Or its vital assistance, more and more yearly, in the greatest practical blessing of all—the security of health; and this, not merely by new applications of chemistry, botany, and surgery—the use of inoculation and the kine pox, but the more scientific attention to hospitals, cemeteries, and measures for cleansing cities—their ventilation and water—clothing and diet, and especially the improving abstinence from fermented liquors, with numerous other matters, so common now as seldom to be traced to their true scientific origin, though generally the offspring of that beneficent parent, and aiding to prolong the chances of life in this country near one-fourth within a few generations.

I must pass by, also, the details as to most of our progress in mechanical science, and more especially in practical machinery—computed by some to have been greater in the last fifty, than the previous hundred years—or in the last hundred, than the previous thousand. Indeed, after all the advances, here and elsewhere, in spinning and weaving, further improvements are almost yearly made in them, and pushed even into knitting and sewing by machinery, as well as thrashing and winnowing grain, raking hay, hulling rice, pin making, card making, the humble manufacture of boots and shoes, and common weighing, by means of the balance or bar of Dearborn, and the horizontal scales of Fairbanks. Were it necessary to adduce more illustrations of the applications here of scientific principles, I might roam through half the contents of our national Patent Office, and much which has never entered its capacious

bosom—from the screw used to remove buildings, to the syphon employed to empty mines—from the vacuum in boxes to raise ships, to that in pipes to carry cars by AIR, with more than steam-like velocity—from the diving-bell to bring up ocean treasures, to its use in making sea-walls and wharves under water—from the pump to empty poison from the human stomach, to the chemical extraction of oil from lard, as well as cotton seed, and sugar from Indian corn; and the chemical improvements in making iron, refining sugar, bleaching cloth, manufacturing soap and glass, and even *loco loco* matches and composition for razor straps—from scientific changes in most kinds of mills and their gear—from the use of the circular saw in many new objects—from planing and grooving by machinery, to the employment of the lathe so as to turn even crooked lasts and gun-stocks, and saw, cut, and punch iron almost as easily as wood; and beside, vast improvements in stoves and warming buildings, and in the new uses of India rubber, and in printing by improved presses and steam, and in the making of paper; to save such time in business also, as to be able to manufacture a book from the rough rags in a single day; tan leather in a week; wear cloth made up from the raw cotton or wool in half that time; convert the coarsest scraps of iron into nails or hoops in a few hours; force the hardest substance to yield before the compound blow-pipe in as many minutes; use galvanism to plate with silver or gold as quickly; paint a portrait by sunbeams in a single minute; and, indeed, carry on distant correspondences by electricity and magnetism, with a speed that would encircle the Globe itself in less than a second; with a myriad of other cases, showing the infinitely new ways in which an ingenious and enterprising people delight to apply science for practical benefit.

If still more illustrations were needed, one might ascend from earth to the heavens, and see what has been done in telescopes, quadrants, orreries, and other instruments, to unfold their mysteries, or convert their movements into guides to man over pathless oceans and deserts; and anticipate, if possible, the still new and gorgeous worlds yet to be opened to our gaze and practical use, through improvements in observatories, and in reflecting glasses, by the continued efforts of scientific skill; and, at the same time, for our awe, and admiration, and religious homage, developing a mechanism in the great architect of all things, as far beyond ours—our highest—as ours exceeds that of the savage—and extending from the flower and crystal, and the living frame of insects, as well as mammoths, to all the marvellous laws of the plan-

etary system, so unfathomable in extent, and skill that, great as were Newton's discoveries into them, they seemed to his mind only a few pebbles on the shore of an ocean.

Passing from the consideration of what has been done mostly in private life in the use of science, I shall next advert to some evidence of the attention of the General Government to the same subject, and which have been not only gratifying to its friends, but creditable and useful to the country.

In a new quarter of the globe, and under the pressure of wars, national debts, and numerous internal improvements, it is natural that less attention should be bestowed on the regular encouragement of science by any government. But that this has been the result of special circumstances here, rather than serious doubts in the many concerning the expediency of yielding such encouragement on subjects of an important public character, can hardly be questioned, if we take a slight retrospect of what has been done in this matter in particular cases. Our people, when at peace, have not, as some suppose, thought wholly of felling forests, or raising cotton, or catching fish and whale, and the beaver and buffaloe, nor have they been engrossed entirely in party feuds as to Presidents and tariffs, or in the amusements and profits of banking and distributions. On the contrary, mingled with these, not only have they in private life encouraged liberally other objects, connected with education and science, but at times have made their governments do it; deeming it right in several instances, some on a small and some on a larger scale, to push the public, no less than private, energies into measures of that character. The powers of government, to be sure, are with us, in many respects, limited by written constitutions, which ought, till altered, religiously to be respected. But all republican governments being made for the people at large, and with a view to advance their interests and wishes, it is proper, that when the people themselves are intelligent and friendly to letters and science, they should seek to advance them in and by the instrumentality of constitutions and laws, and all other public auxiliaries, no less than by private efforts. Constitutions are but means for progress as well as security, and are usually adapted to both; but if found too stringent for the age, can and will be amended. Hence, when our Fathers sought to diffuse intelligence more widely among the whole, they brought the combined power of the whole to co-operate with the liberality of the few, and in most of their constitutions imbodyed expressly some provisions for this object; maintaining in several States, through

their constitutions and laws, and the public treasury, free schools, open to every class of the community; and sometimes they endowed, in the same way, academies and colleges to teach higher branches of education and science. So, by their General Government, under its constitution, they have deemed it lawful, no less than useful, to shower over the whole west and southwest large donations of land, to assist in instilling some of the elements of science and letters into all; to help to remove the forest and stir the soil, not only of that vast territory, but of every human intellect upon it, in order that each might be made to put forth a useful harvest, rather than thorns and thistles.

To form some idea of our patronage in that way, Congress has already granted near half a million of acres of land for Universities and Seminaries of learning; and at the same rate for the other surveyed lands not yet sold, it would be increased to one and a half millions; and besides this, Congress has reserved for the maintenance of schools in the townships sold, near six millions of acres more—swollen to twenty-one millions in the land already surveyed but not sold; all of these are worth at least twenty-eight millions of dollars, equalling in value an annual appropriation of over a million and a half to these intellectual objects alone. No less constitutional and wise has been the policy of Congress to adopt a course as to this District, under their exclusive jurisdiction, which encourages the same interests by large grants to assist colleges here, and found valuable libraries; and to go still further for science in another direction, by using it in the arts to build canals, construct bridges, macadamize streets, and erect splendid edifices at the public expense, and then adorn them with classical statuary and paintings, medals and engravings, and costly colonnades, and every variety of architectural embellishment. Statesmen of all parties, and from all quarters, whether Jeffersons or Adams's, or from the once wilderness of the West, or the fair savannahs of the South, have vied with each other in measures so reputable to the nation; and also for completing elsewhere those buildings designed for objects within our granted powers—such as custom-houses, mints, and hospitals, and doing this, not in the style of barns or stables, but several of them in a manner worthy an Augustan age.

Our mints, themselves, maintained from the public treasury, have likewise proved to be highly scientific establishments, most useful to the community and honorable to the country; and the services of our Engineer corps, whether on public roads or improvements in harbors and rivers, or on fortifications, are overflowing with contributions to the use-



ful progress of science over the whole Union. Our navy yards and docks, as well as our armories and arsenals, are also full of its triumphs through this kind of public encouragement; and not only have the defences of the country been thus strengthened, but commercial intercourse every where increased, in speed, cheapness, and security.

Similar, in its public favor towards this subject, has been the establishment of the grand repository of the inventions of the nation—the Patent Office. Through patents and copyrights, authorized by the constitution expressly “to promote the progress of science and the useful arts,” we hold out that reward to scientific improvements, which not only enriches many of their authors, but promotes at the same moment the interests both of the government and the people, and tends to advance science itself, no less than elevate our common character to a higher standard among the great family of nations.

Inspired by like views, the instruction given by government to youthful officers in the navy and army, has long been bestowed with great liberality and advantage; and though the systems are, in some respects, exceptionable, yet, by the suitable libraries purchased, the philosophical instruments furnished, and the severe sciences taught, the professional mind has been elevated, so as often to reflect back in reputation to the country, and usefulness to its establishments—an ample compensation for every thing expended.

In few other things has greater benefit been secured through science, by means of public patronage, than in the survey of our coast and lakes, now in progress; and in the present system of testing and rating chronometers, and correcting charts, all so vital to the safety of our ships of war and their gallant crews, as well as the whole mercantile marine. These last duties have for several years been pursued in this city with improving success, till, at last, government has completed a public depot of scientific instruments, connected with astronomical observations for nautical purposes, that bids fair, in time, to become worthy the destinies of a great naval and commercial people.

Under a similar impulse, and with many advantages, has science of various kinds been used by the public authorities, and at the public expense, in the recent Exploring Expedition. Among other fruits from it, doubtful latitudes in distant seas have been fixed; dangerous reefs and islands surveyed with more accuracy; errors in charts corrected; and, at the same time, it has assisted to bring home rare plants, and animals, and minerals; sounded new currents of the ocean, and noted the revolutions

of other planets—than what roll over us in northern skies; learned new languages and customs among tribes of the Pacific; and gathered up all which is curious, interesting, or useful in the whole, and published them to mankind, with great care and expense, as national contributions to science, no less than commerce, both for us and the world. Nor has the government been slow to avail itself of the intelligence of the votaries of science in various other ways—such as the geological surveys of some of the public domain, to ascertain and increase its value; the astronomical observations and base lines to fix doubtful latitudes and longitudes, so as to settle boundaries, and save millions of treasure and life from shipwreck; the accuracy and uniformity of all the weights and measures, both State and national, so as to secure exact justice as well as a proper revenue; and the publication widely among the community, for the common benefit, of many of the results of such scientific efforts, and especially of the numerous local surveys of harbors, roads, and rivers; the explorations of the mineral treasures of our public lands, and the experiments so interesting, by Johnson, on the useful qualities of many descriptions of our coal, and by the Franklin Institute and others, on the best methods of guarding against explosions of steam.

In short, the Government, as a government, having a deep interest in every improvement connected with its own operations, has gone still farther, and liberally rewarded several scientific men merely for such improvements. This has been the case for valuable inventions as to gun carriages, locks for cannon, the form of the rifle, and machinery for turning the gun-stock, as well as making of a similar size the various parts of different arms. To these have been added large appropriations for testing, no less than publishing, the plans before referred to, to increase public security in the use of steam, and ascertain the qualities of different kinds of coal; and beside these, for trying fully—what has seized on the public mind so strongly—the practicability of the electromagnetic telegraph.

The public usage, if not sound theory, in aiding this whole subject, seems to have been settled with some commendable liberality, and with much more uniformity than many suppose.

Our Government, though one of limited powers, and in my view requiring the grant of them to be strictly construed, yet, in carrying out what is expressly granted, and in legislating for matters within the District of Columbia, where its jurisdiction is exclusive, has been accustomed, under all administrations, to do every thing in discharge of its duties

which is not prohibited nor reserved, if it seem appropriate. With such exceptions only it has been considered right, in performing what is clearly authorized, to summon to the public cause all suitable aid and powers, whether in nature, the sciences, or the arts ; whether humble or high ; whether using the stone-cutter and carpenter, to give us shelter and erect our fortifications and vessels of war ; or the statuary and painter, to excite gratitude, patriotism, and emulation ; or the geologist, to ascertain our minerals ; or the astronomer, to measure our boundaries and coasts ; or the historian, jurist, and political economist, to enlighten our legislators and judges, by their writings, as well as the executive departments in the performance of some of their difficult public functions. But in many collateral matters, however useful to government, no special interference by public favor has been found necessary to stimulate private enterprise in the advantageous applications of science, unless particular States have done it by rewarding such inventions as Whitney's cotton gin, and such geological and agricultural surveys as Eaton's or Jackson's, tending so manifestly to advance great general interests. In most of these cases the improvements have been so beneficial to individuals, that private patronage has proved a sufficient excitement, in addition to the ordinary purchase or employment of them by the Government, whenever well suited to supply its wants, as they have been sometimes in new uses of old materials, like iron, employed for the hulls of vessels ; or new applications of chemical substances, to preserve old materials, like wood, from dry rot ; or new changes in the form of vessels, so as to sail faster, hold more, or stow better ; or new securities in life-boats, chain cables ; or pumps, blocks, and cordage, improved by scientific discoveries. All these, and hundreds of others, to cheapen clothing and rations for our troops, and reduce the cost of various public supplies, both manufactured and agricultural, benefit every log-cabin as well as the Government. And their usefulness in private life has alone been usually quite sufficient to draw forth to their aid, with wonderful success, the powerful instrumentality of science.

Such, then, having been some of the past efforts and improvements of our people through the aid of science, and some of the encouragements extended to it here, both in public and private life, what lesson, what conviction, should they teach ? What duty does the whole inculcate in this respect hereafter ? Certainly to feel encouraged, by the past, to hope for more in future, and to attempt more in all appropriate ways.

These, in my opinion, should be, not by changing the equal privileges

among us that attract so much of talent and industry into the paths of public life, nor by breaking up the freedom of pursuit, that unlocks, here, every door, and prostrates every barrier in the career of enterprise in any and all employments—from any and all conditions; nor, by violating salutary constitutional limitations; nor, by forbidding those equal distributions of estates among children, that prevent many of those accumulations of wealth, which can be exhausted so laudably in becoming Macænasæ of the age. But they are rather for all to persevere with all the additional means, lights, and energies, derived from experience and success; the People at large patronising, by adopting, scientific improvements, whenever useful—the wealthy assisting those efforts which are more remote and doubtful in their practical returns, as well as assisting the progress of the sciences themselves—and governments, within their granted powers, collecting instruments for genius to use, and materials for it to reflect on and work up for public advantage; and also to reward genius for all its efforts in such improvements by science as become eminently useful in the operations of the Government itself.

We may well continue to imitate more of the splendid examples of munificence towards improvements of this kind in other Republics—such as that of Venice to Galileo, making him, in return for the telescope, a Professor for life, and nearly doubling his salary. We may persist in employing future Haslers on our coast surveys and weights and measures—future Nicoletts on our boundaries and longitudes—future Pattersons on our coins and mints—future Owens on our metals and mines—all these, and much more that might be enumerated did time permit—all, whenever their science and genius can appropriately be used to promote the public interests and glory. Again, nothing should be spared to value science as she deserves, by honoring her votaries in those ways compatible with our institutions—after examples elsewhere so auspicious in the cases of the Romfords, and Jenners, and Davys, and Arkwrights. We must be diligent, also, to discover and commend her excellencies in a thousand objects of practical life the most ordinary, no less than in researches into abstract questions, and metaphysics, and among the caverns of the ocean or the stars of heaven. We must omit no proper means to find out her usefulness in the very cabin, and workshop, and plough-field—on the earth, in it, and around it; and not merely far above, as many when unreflecting are apt to imagine is her peculiar sphere. On the contrary, we constantly ought to bring her home to our business and bosoms in every-day life, and make her the handmaid and helpmeet of

labor as well as of high philosophy. In this way modern science has fortunately clothed chemistry with a new language, intelligent and precise to the plainest learner ; and made it not only analyze the air we breathe, the water we drink, and all the earths and elements around us, and bodies animate and inanimate, but show to the common mind the identity of many of their ingredients and great laws, and pour floods of light over the mysteries of their daily functions, and over most of the ordinary arts, as well as primary pursuits of mankind. It is new benefits like these which constitute the crowning excellency of her improvements, rather than such marvels developed—as that machinery can now spin a bale of cotton so fine as to reach round the globe ; or by the aid of chemistry can beat a few pieces of gold into a leaf that would cover the surface of kingdoms ; or that a microscope will disclose more animalculæ in the melt of a single fish than there are people in the world, and the enlarged telescope unfold, in the heavens, myriads still greater, of planets and stars. So, in geology ; the end is not to ascertain merely that the interior of the earth resembles that of a vast steam-boiler—its volcanoes, safety-valves—its earthquakes, explosions—its mountains and valleys, early expansions or contractions of the mineral crust—and the impressions of fish and huge bird tracks among its rocks, living acts before some of it was hardened ; but it is to learn more of man's marvellous origin, means, sustenance, duration—and more of the probable progress, as well as powers and destiny, of his race, here, if not hereafter. So, in natural history ; the great object should be, not merely to add a new flower or insect, shell or mineral, and there stop, as some seem to misapprehend, but it is to make new tributaries to the comforts and advancement of humanity—to prevent weeds often, and dross, from being longer out of place and worthless, and discover in some new plant for instance, that which will furnish food for millions—like the potato or Indian corn ; or new dyes to the arts, like indigo and madder ; or the same in some new insect or shell, like the cochineal and purpura ; or new medicine and clothing in animals themselves, like the Spanish fly and silkworm ; or unfold new uses and values in old substances, like ammonia and potash, so employed as to accomplish what has been considered so superior to the doings of all mere politicians—“ to make two blades of grass grow where only one did before ;” or, like electricity and galvanism, so applied as is now doing, as to promote a similar good in agriculture ; or, like whale oil, find a new market in increasing the speed of locomotives, as well as manufacturing machinery ; or, like

*salt*

last, by new extracts of soda from it, advance astonishingly several most valuable branches of business. This last, though in appearance so humble an improvement, is said already to employ more capital than the whole coffee trade of the world.

After applying usefully all scientific discoveries, whether made at home or abroad, another object should be to move onward still further, and do our part in enlarging and perfecting the sciences themselves. Not content to be mere copyists or imitators, let us strive for a due share of originality, freshness, boldness, independence; seek to make new discoveries in every thing useful; force from nature more of her secrets; increase as well as diffuse knowledge; and excite and draw out all our latent or peculiar advantages—every thing new in our country, or its productions or social position, and thus add our full share to the great truths and common treasures of the civilized world.

But I have not time to enlarge on this, and should here terminate the argument, were it not manifest that many suppose the public mind, under our political institutions, is more stiff-necked or impracticable than elsewhere in encouraging improvements either in or by science, and more skeptical as to their utility, as well as the public authority or expediency in any way to patronize them. But in my apprehension the facts already alluded to show this to be a mistake.

The chief difference is, that many, rather than a few, are here to be convinced. It is here the many who are to be benefitted; the many who pay and rule. The public mind itself is even more open than elsewhere to argument, if it be, as most of us believe, more enlightened; and only satisfy it that any encouragement of science is likely to end in practical good, and our whole history demonstrates, it will be seized on with an avidity even beyond what exists in most other places. Our people are also a reading, and reflecting, and ambitious people; and if you convince them that the encouragement of science has in other countries proved commendable and useful, will they not believe that such encouragement is even more so here? And will they not see that it eminently becomes a people, claiming to be the most enlightened—a Government, boasted to be the best—to discover and secure promptly, all possible benefits, and call forth all latent powers? Will they permit a Government of the people to be unjust to the people themselves, and neglectful of their advancement?—a free and christian Republic to be cast into the shade by monarchies, and even Pagan despotisms, as to any thing that expands the intellect, elevates the soul, ennobles the character, or augments its power, whether in arts or arms?

On the contrary, ought we not to expect them to use every proper effort to shun the sneers of foreigners at our incapacity, and to falsify their scandals, that we are inclined to make war on learning?—or play the Goth with the splendid monuments of arts and science—consigning, Omar-like, libraries and cabinets to rottenness or flames, and evincing a Jack Cade aversion to every thing that favors progress in intelligence or civilization? Very far from such a spirit was that of the founders of the colleges, and the tax-paying supporters of the free schools of the North, or of their imitators in the South and West, or of those who incorporated into our land system such liberal grants by the General Government for both colleges and schools; or of the statesmen, who made it an express constitutional duty to encourage inventions and authors, under a far-seeing sagacity, that otherwise we were not likely to keep up with the age in scientific improvements, and be able to compete with foreigners successfully, whether in producing or selling, either at home or in the markets of the world, by making as cheaply our vast products in agriculture and manufactures, and navigating the ocean with them as cheaply as others.

But the considerate must see that there is an obligation devolved upon us, as the leading Republic on this new continent, much higher than merely to avoid censure, or aspire to equality, in these respects, with arbitrary governments.

It is to demonstrate to the old world, by deeds, no less than reasoning, that our new theory of private rights and public duties is conducive to progress in every thing useful; and this should not only become the views and the effort of the statesman and the patriot, but it will be a common and national feeling, more and more yearly, with every new ray of light poured into the public mind, and with every new sting of insult or taunt from foreign envy. Already do many see that, with some obstacles, there exist many encouragements to scientific exertions, growing out of our peculiar institutions, and which may, by a useful policy, and conviction among the many of its truth, be made to render that exertion not less, but even more, effective, than in any other portion of the globe. Thus, in a population of twenty millions, for instance, where most are educated and aspiring instead of a small fraction, and where the intelligent force of all kinds, in any given number of persons, is trebled or quadrupled, and the masses, instead of being a dead weight or clog as elsewhere, unites with the rest in imparting stronger momentum to the whole advancement of society—can it be tolerated for a mo-

ment, that the scientific progress of the whole is to be retarded by such vital differences? On the contrary, have we not, and will not our community think and act as if we had, a new mission before us, to illustrate the increased energies of the many over a few in science, no less than other things, by requiring, and thus rewarding and encouraging more frequent efforts—efforts on more subjects—and efforts for, as well as by, a far greater number? The consequence has been already, that where one person formerly used his intellect entirely in planning inventions, or advancing his fortune by new instruments or machines, fifty now do it here, and demand corresponding aids in proportion from science and letters. So where one then read, and thus made a market for books, twenty now do it here, and increase the production and sale of reading matter in a like ratio. Hence many are induced to engage in literature and science, either for bread, philanthropy, or glory, who would never have attempted it before; because, instead of a rich patron here and there, or a jail, they now have millions in private life to buy and employ, or applaud, and at times, as public stimulants, either grants of money or profitable business, or the brilliant attractions of foreign embassies. Instead of the interest of our people, then, in these efforts, by science, being less, or more difficult to reach and excite, a wider door is opened and broader stimulants are presented for her exertions; and, in this way, much more is likely to be matured here, as to improvements in and by science, and matured, not accidentally, but by continued exertion and appropriate means; by new laborers added, or new experiments tried; or new facts collected, or new excitements offered to the human intellect. There is encouragement in these, because the art of printing, for instance, that daily boast of modern science, was invented only by pushing a little further, and maturing the seal or signet which had been used for ages to print names and symbols; and steam, applied at last to cause motion on land or water, was only a mere extension of its power from fixed to moveable machinery, as had been extended before—the power of wind, and of the horse.

The railroad for transporting passengers with such speed, was but maturing the use to which it had been applied near a century, for carrying heavy burdens on levels and inclined planes. The electric telegraph, likewise, so simple, and yet so effective, is another evidence of the benefit, under the wider and freer impulses here, of persevering efforts and new combinations, which escaped even the ingenious mind of Franklin. So Kepler's discovery of the general law between the revolutions and



distances of the planets, so perfecting every way to that science, by which we see the celestial mechanism that changes the seasons in order to make all parts of the earth habitable and fertilized, and are enabled not only to triangulate or survey its surface, and navigate its oceans, but measure time, measure the heavens themselves, and fix the dimensions of the planets, no less than their distances and revolutions—I say, that did not happen till near sixty centuries had been devoted, more or less, to the study of astronomy, and Kepler himself had spent seventeen years of patient research on it, and then announced it to the world with this memorable exultation: “The die is cast—the book is written—to be read either now or by posterity, I care not which. It may well wait a century for a reader, as God has waited six thousand years for an observer.” What to this is Cæsar’s *veni, vidi, vici!* or Alexander’s sighing for more worlds to conquer? And though the exact moment or place can not be foreseen, in which the blow shall draw fire from the flint that never before sparkled, or the seed vegetate that has slept in its coffin for ages, or polish display the latent beauties of the marble which is still in the quarry, or science discover new mechanic powers, new wonders in animal life or vegetation, and new agencies in nature, out-rivalling wind, water, fire, and electricity; yet we do know that the field is broader here for such exertions, the skies brighter, and the masses daily more fitted to appreciate what is valuable, and to need and attempt it, as well as to encourage others to attempt it. We are all, too, more inclined than formerly to expect it from suitable efforts, rather than calculating to gather figs of thorns; and to look for valuable improvements here, not by neglect or indifference, but the use of means—means appropriate, both public and private, stirring the soil of the mind by the plough and the hoe, suiting the seed and culture to the position, inviting sunshine and showers, and keeping all in more constant as well as vigorous action, by letting the enlightened impulses of our free systems have full play. Even then we may not be able, and our people may not be convinced that they should try, to rival Paris, or Vienna, or Rome, in some of the fine arts, used more to embellish and please than strengthen, as we do not wish to rival them in some of the causes of their splendor—a long and wealthy race of Princes, and a neglected, if not plundered, people. But, if we do not quite as fast do all that constitutes a State, in raising “men, high-minded men”—if we do not elevate the masses in morals—educate, multiply, and enrich the whole—improve the country in its agriculture and manufactures—strengthen its defences—expand its

commerce, and enlarge all its capabilities for good, as well as contribute a full share to the progress of useful science—then the peculiarities of our institutions will, for most purposes, prove worthless, and our citizens must cease to exult in them. It may turn out, likewise, that our people and governments will not be persuaded to patronise, so much as some others do, abstruse inquiries and curious researches. For, though the pursuit of alchemy or the philosopher's stone, as well as of an elixir to cure all diseases, probably led to the great discovery of gunpowder, and some of the first improvements in modern chemistry; and though the study of astrology was the parent of modern science in astronomy, it can hardly be expected among a people and governments, where the tendencies, the impulses, and ends are all practical, that remote benefits will attract favor so strongly as more immediate ones; and hence, the more secluded walks of science must here generally rely more on the bounties of a few than the encouragement of the many—or of public bodies—and depend as much on the taste, means, and perseverance of its own votaries, as do in most cases all those pursuits which yield only very distant returns; or those which, looking to pleasure and glory more than profit, find their greatest reward in expanding the mind, and producing more elevated feelings, and a higher purity of life. But the impression is yearly gaining ground in this country, that it becomes us all, under every discouragement, to discover and reward the usefulness of science, however, wherever, and whenever, it may be developed. Such a course, it is beginning to be seen, will not merely extend her empire, but enlarge the empire of the very classes who usually heretofore have been supposed to possess least interest in her progress; for the masses have already been aided, if not enabled through her, to control many of the adverse influences in society, whether of birth, ambition, or monopoly; and, as one instance, by a new scientific combination only of nitre, sulphur, and charcoal, imparting a much greater importance to the lower classes in wars, and preserving from extirpation, by barbarians, the arts, letters, and civilization of modern times—they have found that these arts and letters are now, by their longer life from this cause, and their wider diffusion, even to new worlds, by another application of science, through magnetism, to aid navigation—and by another still, through the press—are now penetrating deeper into all the under layers of society, and working among them most unprecedented revolutions. The masses, then, that possess an influence here so predominant, must, and do, see and feel more, every year, this auspicious truth. Conviction of the utility of

scientific improvements to labor itself will thus more and more press on them from all sides, and, being better informed yearly, they will discover quicker and further their own true interests; and, in connexion with them, the vastness of the changes going on in their favor. And we need no stronger evidence how this is influencing the whole operations of our social system, and elevating the working classes so as to appreciate it, than to remember that man is sometimes distinguished from other beings by calling him "a tool-using animal," and that it is in these tools—in labor-saving machinery—the greatest advances have been made; thus enabling, not merely one person to perform the work of two in some branches of business, and of hundreds in others—maintaining, in this mode, a population both larger and better—but that while science has helped in this way to quadruple manufactures, facilitate commerce, and greatly improve agriculture, these very additions have, in their turn, caused still further ones, and enabled all benefitted by them more liberally to reward, not only labor, but the efforts of science herself, and thus increase her progress; acting and reacting till no limit can be assigned to her advancement in the long vista of the future, except what grows out of the finite character of the human faculties, the shortness of human life, and the imperfections of every thing earthly. The nature of man is well known not to be changed by this, and by most of us is not expected to be; but the great difference is, that the means of progress here have, in many things, become so wonderfully advanced by scientific improvements, we may justly unite with him who pronounces science to be "the mightiest Titan now beneath the skies;" and well hope that his—

———"march is onward, onward, to impart  
Some Archimedean power that yet the world may start."

Whole orders could now more easily be maintained in devotion to scientific pursuits, than a few individuals could be formerly; and in this way, beside the increased attention of millions occasionally to suggest and advance improvements, many are enabled to make it the permanent business of their lives, and perfect more, and invent more, what shall not only enlarge the boundaries of science, but the dominion of man over rough nature—subjugating all the elements around him, faster to promote the comforts, the wealth, and glory of the human race. Whatever may have been the case once, our people are now beginning to rise above the indulgence of any narrow prejudices as to this; for they see that persons, employed like these last,

are not drones in the social hive. While some make the honey, others equally laborious collect wax to form the cell; others construct it, and others toil in polishing it. Each is useful in his appropriate sphere, and most of our population have become entirely competent to see that each person becomes, in human affairs, more useful by more careful training, and more liberal and appropriate acquirements.

Indeed, learning is vain—all education is vain—if we cannot, and do not, appreciate better, as better educated, the importance of this training, and all appropriate information, scientific or otherwise, for particular stations and pursuits, and raise the standard higher, which is required for distinguished success in all the more difficult professions and employments.

One of the peculiarities of our whole country, as far as the settlements extend, has become, that we now have no uncivilized portions, in the common use of that term; all being occupied by men accustomed to many of the practical benefits of science before their emigration, and carrying with them tastes and intelligence to introduce these benefits as speedily as possible, and to appreciate their value, rather than oppose the encouragement of them. Or why do you see the steamboat smoking its way even to the Falls of St. Anthony? Or why the railroad and canal stretching across regions where but recently the hunter trapped his game? Or why cities rising near girdled timber, and schools and colleges planted on the skirts of forests? Even the Passamaquoddy Indian has become convinced of the inferiority in travelling of his birch canoe to the steamboat and railroad car; and while he now uses the aid of science in his migrations, as well as in his rifle and gunpowder, instead of the bow and arrow, and in his machine made woollens and cottons, rather than skins for clothing, he but recognises that confidence in superior science and skill in all appropriate matters or stations, which has increased, under the lights of the nineteenth century, over our whole country; is increasing still faster, yearly; and which, by due attention, will hereafter work still greater wonders.

Not that this will make our people wish, as some seem to fear, to break up the tried systems of education for mere youth, and to wage war on classical literature, and substitute in schools philosophical instruments, and steam engines, and model machinery, for books and moral teaching, or to desire what Lord Bacon deprecated—"a solitude in respect of able men, to serve them in causes of State." But with a due regard to those,

it will, and it ought to, render them anxious to furnish more substantial helps to middle and advanced life, no less than youth, and enable the industrial classes more fully to master those numerous uses of science, which assist so directly to strengthen individuals, as well as States and empires.

Nor does this course towards science and its votaries tend, as some, without due reflection, apprehend, to patronise a particular class in society, and therefore become objectionable under our institutions; but, on the contrary, it patronises from all classes, as is just, those individuals who may choose to try to educate themselves, soundly, for their peculiar spheres. They may come from the workshop, or the vessel's deck, or the farm, as well as the parsonage or palace—come, as did Franklin, and Fulton, and Bowditch, and Rittenhouse, cradled amidst labor, with hard hands and sinewy arms. It is the same, if they only wish and will to advance; and, if the coal from the altar of science but touches their lips, then they alike see with new eyes, hear with new ears, and a fresh spirit seems to them, (some in one thing and some in another,) poured over the face of nature, and breathing into it new uses and new forms of life, beauty, and design. They then, too, equally attain honors and wealth—fetes and exhibitions do homage to the plough, the anvil, the saw, the type, and the compass—royalty, no less than the multitude, seek to use, as well as admire, their best productions; and the brow of honest labor, lighted up by science, becomes often no less conspicuous in courts and cities, than in hamlets or on the lawn.

Ought we, then, to distrust the intelligence of a people like ours, to appreciate properly, and promote properly, the benefits of science?

Closing the considerations on this subject, which, I fear, have already been extended too far, it may be deemed proper for me, before sitting down, to state whether, beside the general encouragements in private and public life, already referred to, any further particular acts appear necessary to be done here, to advance the cause of science and its various uses, so as to be beneficial to the country at large, no less than this District. With much distrust of any opinion which may conflict with what comes from others who have devoted more attention to this subject, it seems to me, that we want, in this place, as likely to be thus beneficial, first, buildings of elegance, and liberal accommodation for objects of science and letters; then, libraries, that furnish the best food of the mind—the medicine of the soul—resembling in character, if not size, those of Jena or Gottingen, or the choicest abroad. Next, full collections

in every leading department of natural history ; then, free lectures on useful branches of knowledge to all who may please to throng their spacious halls ; then, a wide publication of all new inventions and new theories ; next, all valuable instruments in philosophy, and laboratories for experiments ; and lastly, over the whole, the control, vigilance, and co-operation of the ablest men the neighborhood will furnish, to carry into effect the instructions of Congress, watchfully given from time to time, under the temper and influences of our free institutions, and with a noble devotion to the improvement of every art and science, and every rank and condition in life. Of all this, except the Congressional library, and some fruits of the Exploring Expedition, we have got only the National Institute, whose members I now have the honor to address. It is not simply the acorn of all we hope for ; but, at the same time, it is farther still from being "the brave old oak" of a thousand years' growth, and beauty, and strength, to which we look forward. Planted in a city, not of the largest class, unaided by great endowments, and existing at all but a few years, it has still, under some countenance of the Government, and by the disinterested zeal and efforts of a few individuals, become somewhat known and respected abroad as well as at home. It makes no pretensions, compared with what has been growing elsewhere for centuries, and what elsewhere has had, for encouragement, the munificence of royalty, and the daily smiles and exertions of throngs of savans and scholars. But the eyes of many in the Union, and in foreign lands, have been turned anxiously on its progress, to see how its labor may succeed in applying science more to aid practical life ; and by observing and describing, collecting and preserving, with increased attention, all that is curious or rare in this new world—to throw more light on the life and character of its Aboriginal inhabitants, or its animals of all kinds ; its plants, shells, and minerals, as well as its lakes and rivers ; its prairies and mountains ; its tides, winds, and seasons ; or something more of the mysterious history of its settlement and civilization—as in Mexico, Yucatan, and Peru, previous to the last four hundred years. Among several other objects, one of the departments of the Institute is specially devoted to "American history and antiquities ;" another to "the application of science to the useful arts," and another to "agriculture."

Much, certainly, has already been accomplished by aiding to furnish many new materials, books, and valuable collections, to assist in scientific researches ; and the admission of all persons freely to the inspection of what it possesses, has made not merely a few generous in-

increasing those collections, but has begotten a zeal, almost universal, to contribute something, if even the widow's mite, to swell them. It has developed, also, some new ideas in its public papers, creditable to the country; and has been the means, of what it expects to repeat often, under larger resources, of gathering, occasionally, into one body, many of the best intellects of the Union, for interchanging, not merely specimens, but scientific views and projects, between different, as well as the same classes and professions—thus breaking away, at times, from the dusty turmoil of the world and of politics, and mingling in peaceful meetings, where all are learners of something beneficial to themselves or the community, while acting side by side in that greatest of all republics, “the republic of letters.” The communion of minds there—the mutual discoveries and improvements made, and the impulses imparted by new articles, new books, new instruments, new suggestions, will often be felt widely afterwards, amidst the lights and shadows of life, and be diffused rapidly in a country, where neither political nor religious intolerance and bigotry can resort to dungeons and penances to delay the spread of new theories in science or philosophy. However slow, then, may seem to be the influences of institutions like this, they often stir, in these ways, the soil, or sow the seed, which in time yield a new principle or invention that improves the world for ages; and when great results seem occasionally to happen from accident, or on a sudden, they will be found, in most cases, to be but the mature fruit of what begun, in this or some other way, ages before; and hence, the fall of an apple, or the repair of an old engine, with minds like Newton's and Watt's, only helped to solve the last of their perplexities, after much had been previously thought, and said, and done, to become ripened for improving such occurrences. It would seem then, that all, in addition, which is needed here to promote the cause of science, and diffuse its blessings still more widely over the whole country, might well be built on the Institute and collections which now exist; and if I am asked, who shall be the builder? and who furnish the materials? I would say, in reply, that some expect a few minds in advance of the age, or emulous of good deeds, and possessed of surplus thousands, will, ere long, dedicate some of them to this philanthropic end; and thus, by what would otherwise be squandered, perhaps, among thankless heirs, become enrolled with such benefactors as the Yale's, and Harvard's, and Phillips's.

But till such an event occurs, others contend, plausibly, that Congress is bound, by its relations to this District, as well as to this important sub-

ject, to take all necessary steps here, for its advancement, through some institution, which shall be national in its origin, so as not to offend our pride of character; and national in its benefits, so as to comport with that spirit of justice and equality that ought to pervade all our public measures.

No constitutional difficulty, under this view of the subject, existed with General Washington or Mr. Madison, and two grants of public lots, in this city, large in value, were actually made by Congress to the colleges existing within this district, under President Jackson's administration. But if, after this, and the cases and analogies before cited, honest scruples should still exist against such a course, it has fortunately happened, that a foreign philanthropist has opened another way for accomplishing much that is desirable, without any resort whatever to any public means. Smithson has placed in trust with the Government a most liberal fund for increasing and diffusing knowledge among men. It has been accepted, and this Institute is an existing, and seems to me a most appropriate, agent to be employed under the directions of Congress, in discharging portions of so important a trust—a trust, so sacred and imperative, that a longer delay to execute it might prove not a little derogatory to our national honor.

Should the plan for this not be speedily matured, including the use of the Institute, or its officers, then a grant, at once, of enough to defray the expenses attendant on the good preservation and collection of the public materials in our charge, seems indispensable, and is believed also to be free from every doubt connected either with expediency or the Constitution, as many of the collections now belong to the Government, and all of them are vested in it when the charter expires, and may be forthwith, if desirable. What small sum then is granted for this object, by the Government, is granted for taking care of its own property, the title of which is public, the use public, the whole end and aim public; and that act of duty done, we hope, by the further help of our own contributions, with those of liberal friends of science elsewhere, by the continued and generous assistance of the officers of the army and navy, of our foreign ministers and consuls, and foreign friends, as well as the members of Congress, and many in private life, I think it may be safely said, that we hope to advance still further and faster, till we render the Institute, in many respects, worthy its unrivalled position, and the growing country to which it belongs. In fine, as our materials multiply, and needy and enterprising genius resorts to them for aid, and the Capitol of



the Union becomes more crowded for business or amusement, all whether in private or public life, will also have in it a place of resort in their leisure, more instructive than gaming or the bottle, or too much of the frivolities of fashion; and the influences of this for good, like those of the invisible dews, must be more and more felt through the whole republic, and to the remotest posterity. And not the least of the advantages will be, that which flows to mankind from all kinds of encouragement to scientific developments of the laws which pervade and control every part of creation—I mean the increased moral and religious feeling they are calculated to inspire. Instead of tending to check this, as some fear, they are, in truth, a revelation of, and from God, almost as striking as ever was written on tables of stone, or by the pen of prophet or evangelist. Nature is thus full of apostles from on high. And if an undevout astronomer has justly been denounced as mad, how truly must that person have eaten of the “insane root,” who can trace out similar ways of Providence even in a dew drop, or ray of light, no less than loftier objects, and not become, at the same moment, more humble in the visible presence of such Almighty wisdom, and more disposed to obey all his wonderful laws.











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